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> The function of education is to teach one to think intensively and to think critically Intelligence plus character—that is the goal of true education

CSIR NET - GENERAL APTITUDE

QUANTITATIVE APTITUDE

L-1 | **Number system**

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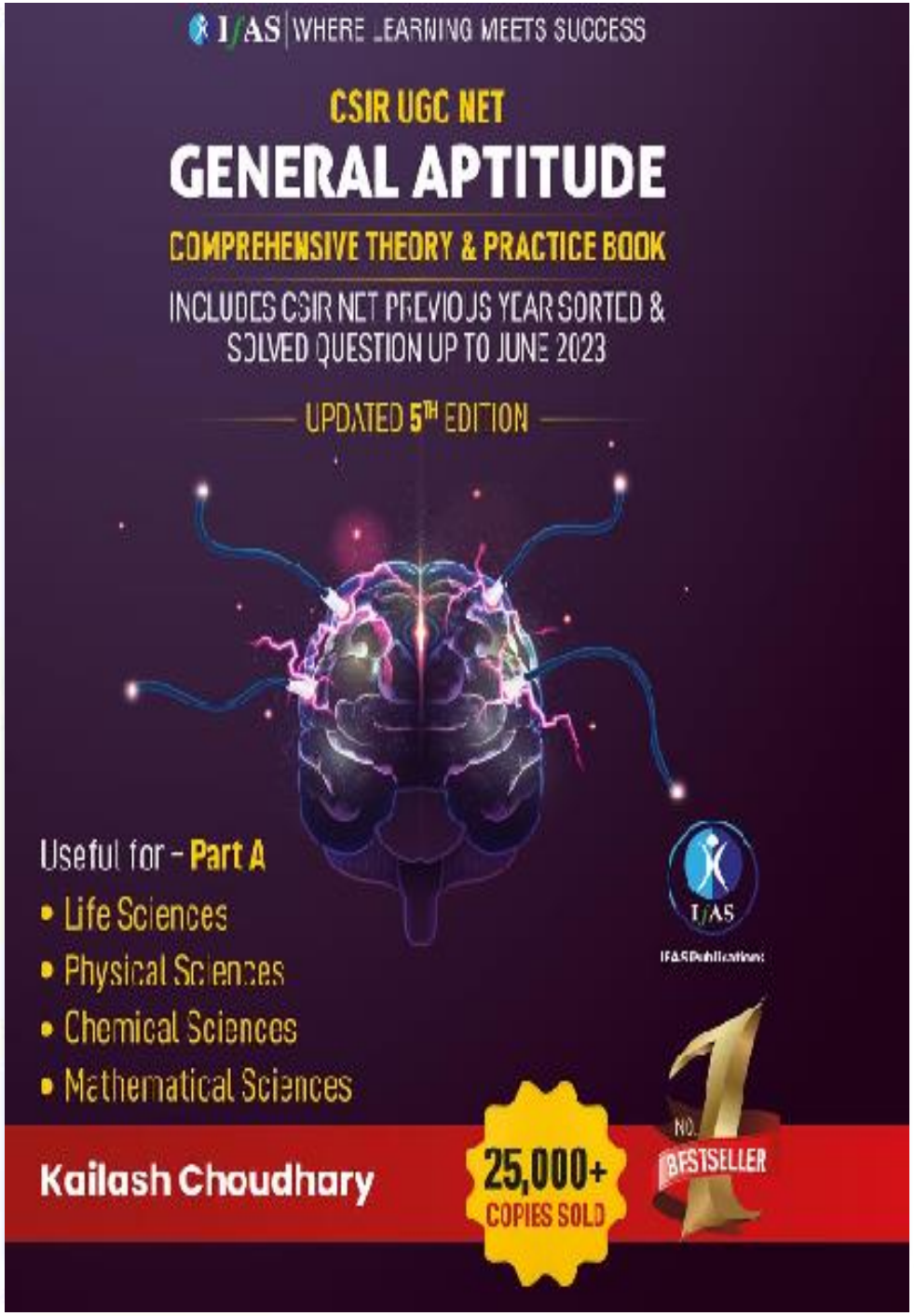


Total

- 20 Questions

Maximum Attempt

- 15 Questions

Each Question: 2 Marks

- Total 30 marks

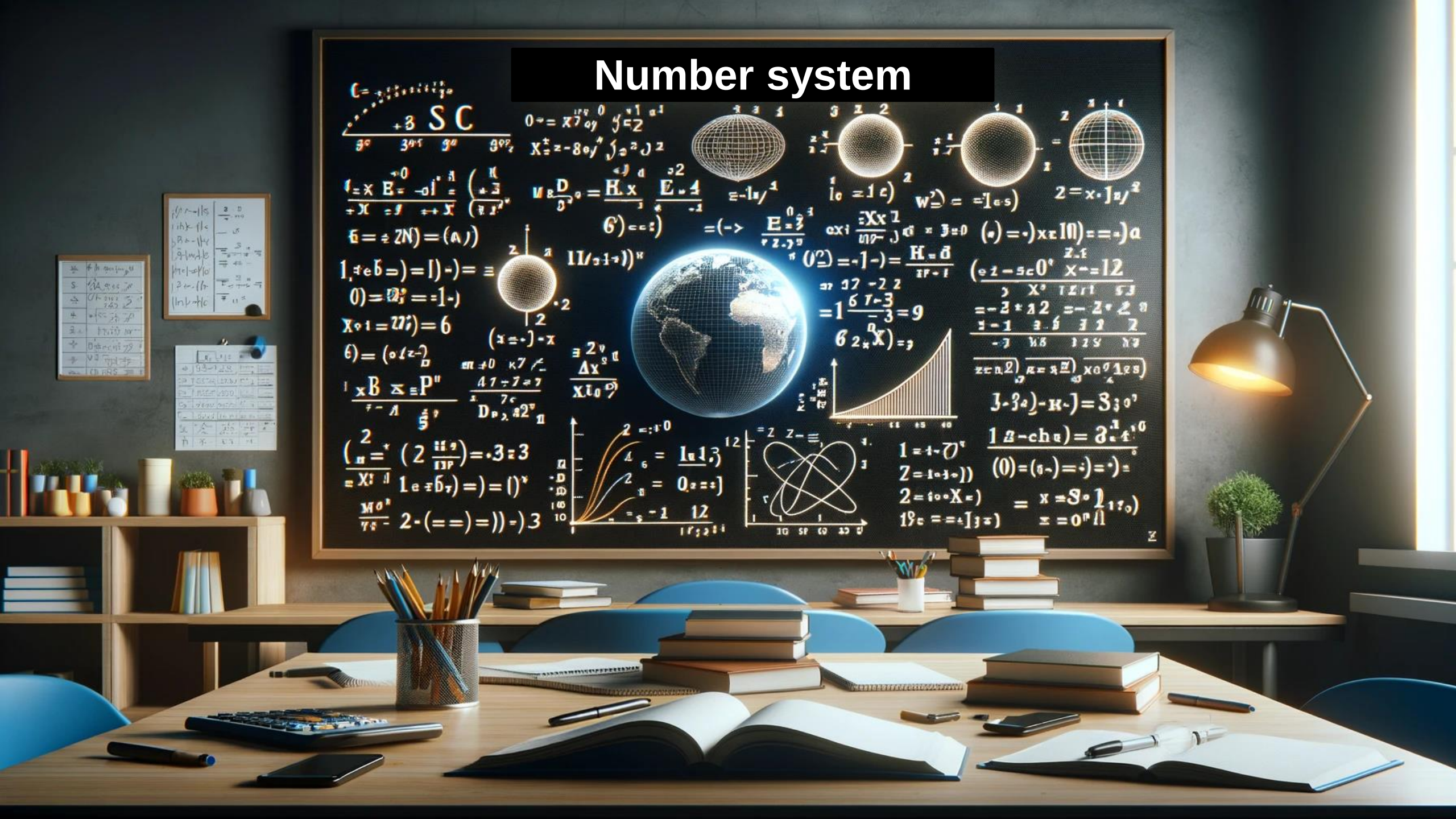
Maximum Time Investment

- 30 Minutes

Topic Covered in Today's Session

1. Types of Number
2. Divisibility criteria
3. Exponents
4. Finding the unit digit
5. Practice questions

Number system



Types of Number

Natural Numbers: The counting numbers 1,2,3 (Donot include 0 or -ve)

1, 2, 3, 4, 5 _ _ _ _ _ _ _

Whole Numbers: Natural numbers + 0

0, 1, 2, 3, 4, 5 _ _ _ _ _

Integers: Natural numbers + 0 + negative

-4 -3 -2 -1 0 1 2 3 4 5

Even Numbers and Odd Numbers

Even → Divisible by 2

1 → Not a prime

Prime Numbers: 2, 3, 5, 7, 11, 13, 17, 19, 23 ….

→ Divisible by itself or 1

$\frac{3}{3} = 1$ $\quad \frac{3}{1} = 3$

Ex ⇒ $\frac{15}{15}$ $\quad \frac{15}{1}$ $\quad \frac{15}{5}$ $\quad \frac{15}{3}$

Composite Numbers: Greater than 1 and not prime 4,6,8,9,10

~~1~~ ~~2~~ ~~3~~ 4 ~~5~~ 6 ~~7~~ 8 9 10

4 6 8 9 10

Rational Numbers = ¾ or 18/1 → $\left(\frac{22}{7}\right)$

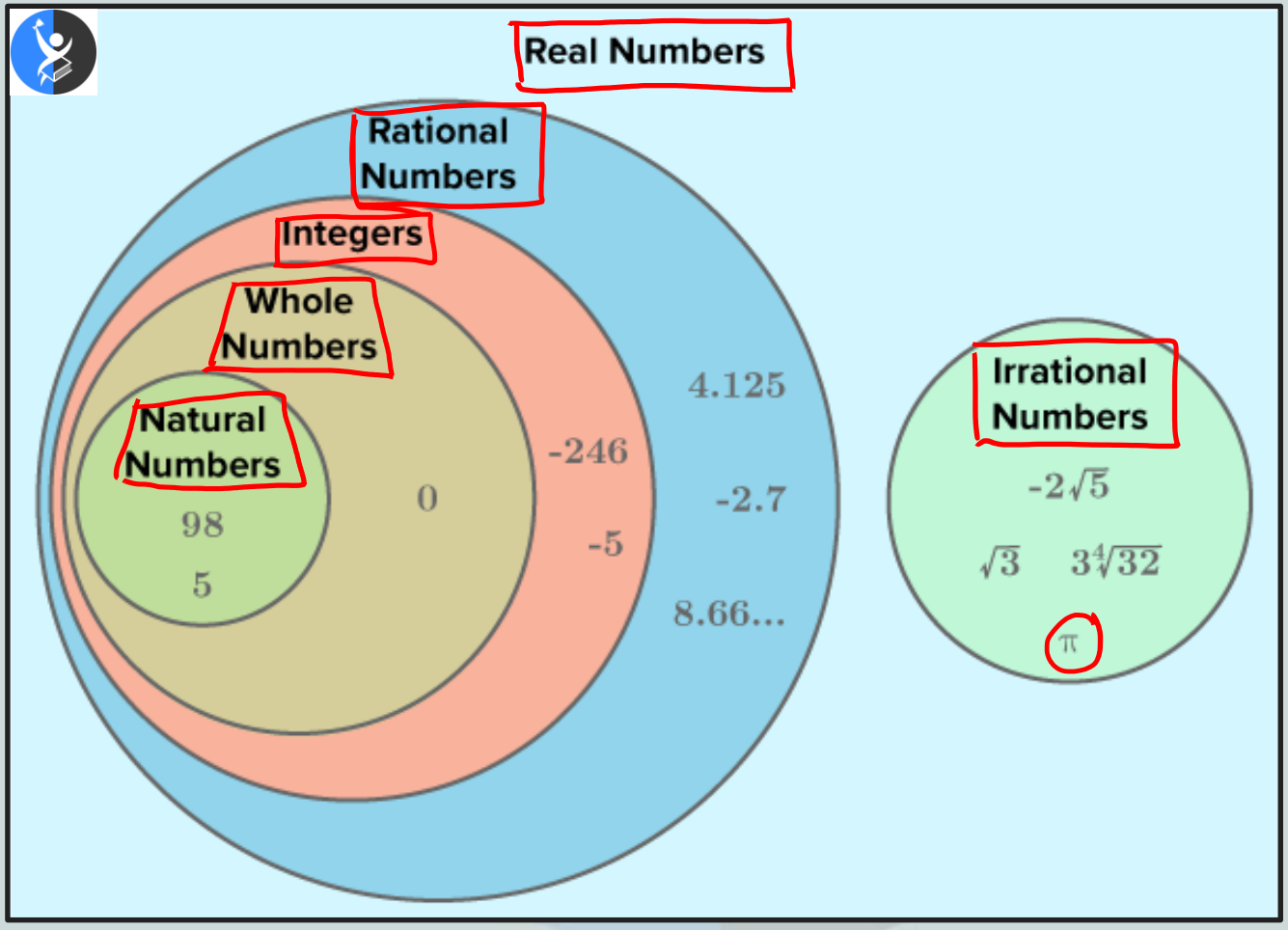
Eg ⇒ $\frac{2}{1}, \frac{4}{1}, \frac{5}{1}, \frac{8}{1}, \frac{99}{1}$

Irrational numbers = π = 3.141592…
or $\sqrt{2}$ = 1.414213…

2.5 → Rational

$\frac{25}{10} = \frac{5}{2}$

Decimal Number


Real Numbers
Rational Numbers
Integers
Whole Numbers
Natural Numbers
98
5
0
-246
-5
4.125
-2.7
8.66...
Irrational Numbers
$-2\sqrt{5}$
$\sqrt{3}$
$3\sqrt[4]{32}$
π

Divisibility criteria

A number is divisible by 2

- If its last digit is 0 or divisible by 2 (i.e. 0,2,4,6 or 8).

A number is divisible by 3

- if the sum of its digits is divisible by 3.

A number is divisible by 4

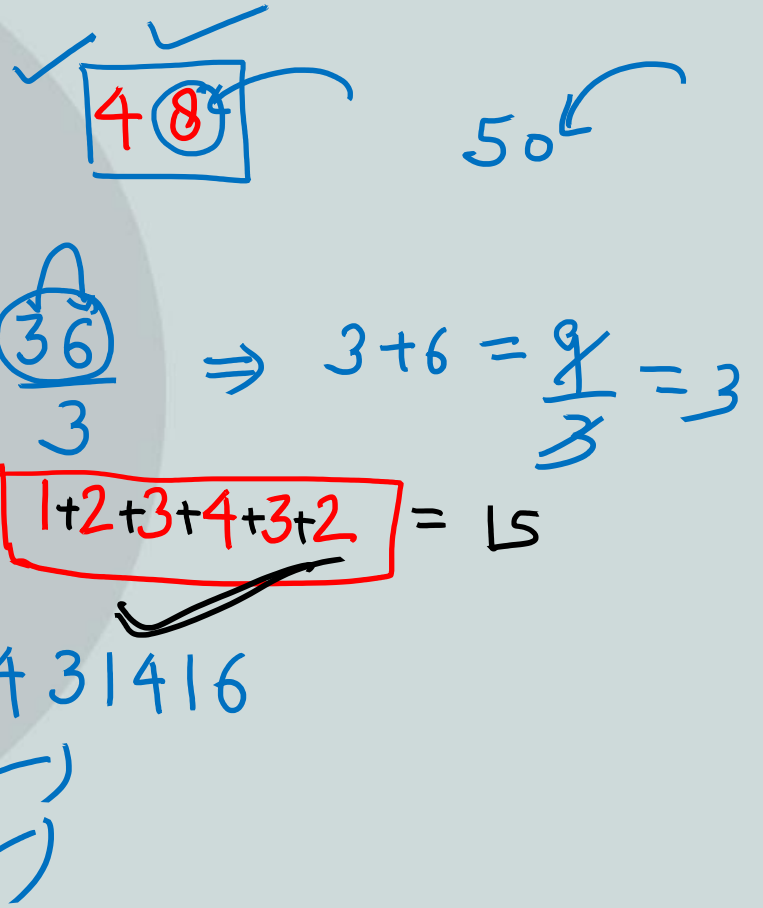
- if the last two digits of the number are divisible by 4 or both are 0.

A number is divisible by 5

- if the last digit is 5 or 0.

A number is divisible by 6

- if the number is divisible by both 2 and 3.



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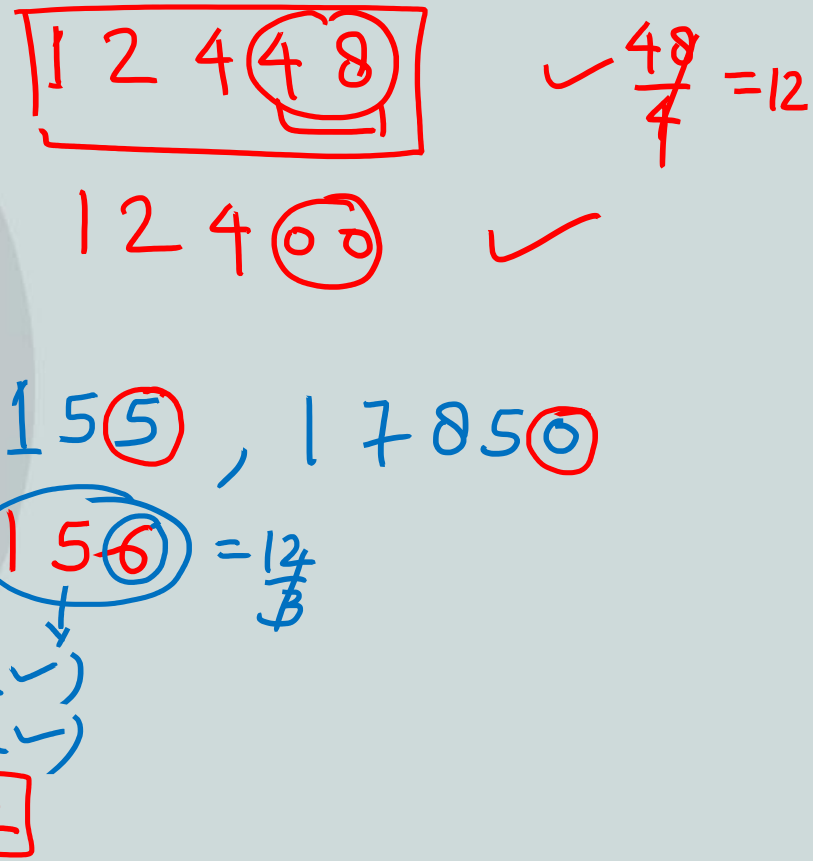


A number is divisible by 7

- if the number follows the given condition –
- Double the last digit and subtract it from the remaining leading truncated number. If the result is divisible by 7, then so was the original number.

A number is divisible by 8

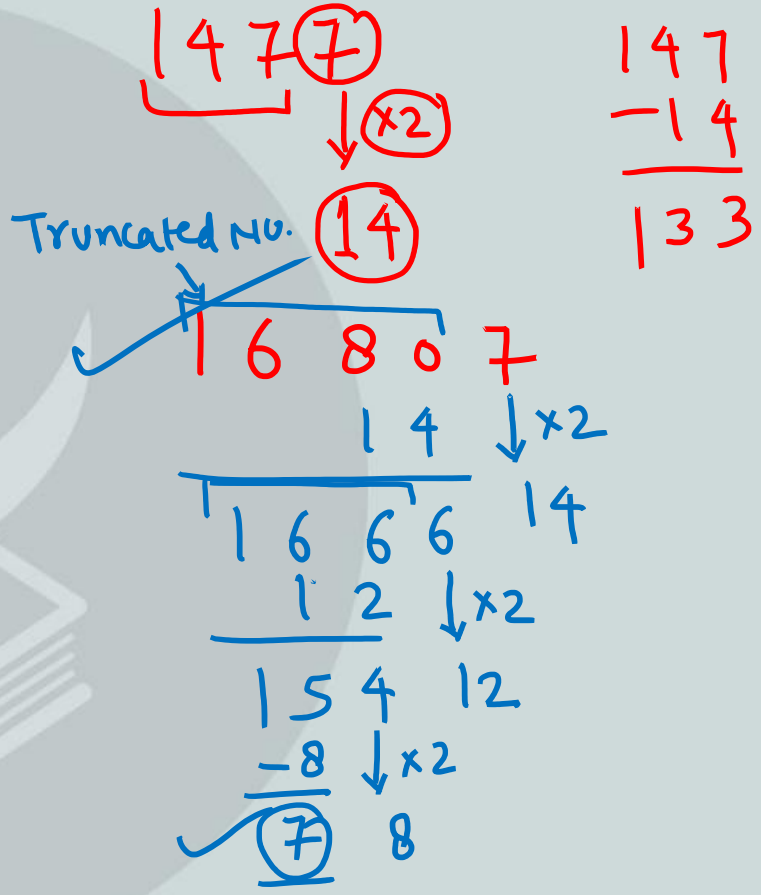
- if the number formed by the last three digits is divisible by 8.

A number is divisible by 9

- if the sum of the digits is divisible by 9.

A number is divisible by 10

- if it ends in a 0.

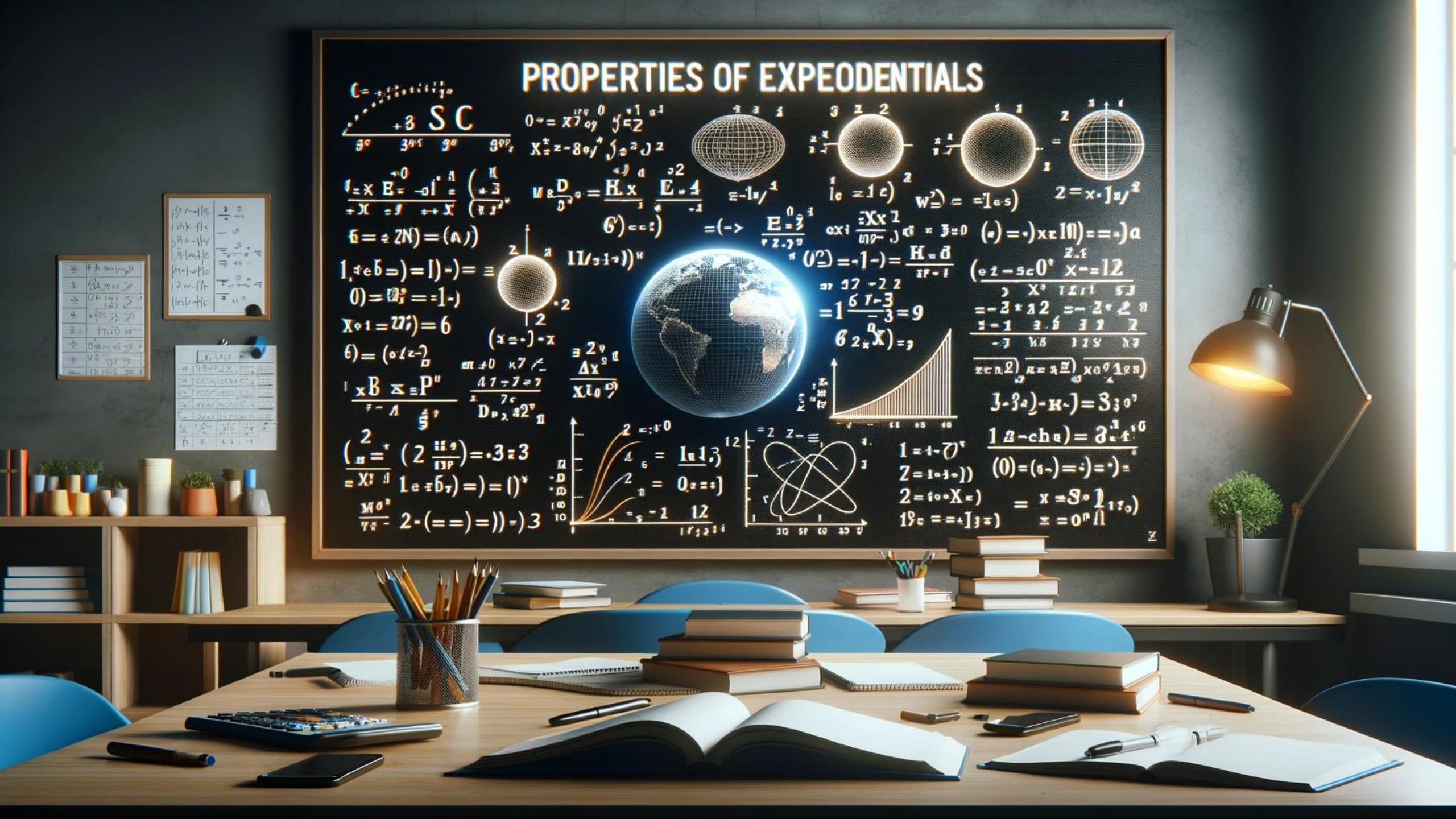


2479168

$\frac{168}{8} = 21$

$3+6+1+2+6 = \frac{18}{9} = 2$

$3+6+7+2+4+5 = 2+7 = \frac{9}{9} = 1$


PROPERTIES OF EXPEODENTIALS

Exponents

EXPONENTS

5^4 → Exponent, power or index

Base number

$5^4 = 5 \times 5 \times 5 \times 5 = 625$

The exponent (power or index) of a number shows how many times the base number is being multiplied by itself.

5^{4} → Power

Base

$5 \times 5 \times 5 \times 5$

$2^5 = 2 \times 2 \times 2 \times 2 \times 2$

$= 32$

Exponential properties

Properties of exponents

- $x^0 = 1,\ x \neq 0$
- $x^n \times x^m = x^{n+m}$
- $x^n \div x^m = x^{n-m}$
- $(x^n)^m = x^{n \times m}$
- $(x \times y)^n = x^n \times y^n$
- $x^{-n} = 1 \div x^n$
- $(x/y)^n = x^n / y^n$
- $x^{\frac{1}{n}} = \sqrt[n]{x}$

$$a^m \times a^n = a^{m+n}$$

Powers

Same Base

Eg ⇒ $2^4 \times 2^2 = 2^{4+2} = 2^6$

$5^9 \times 5^{11} \times 5^{20} = 5^{9+11+20} = 5^{40}$

$a^m / a^n = a^{m-n}$

Same Base

$$\frac{2^{5}}{2^{2}} = 2^{5-2} = 2^{3}$$

$$\frac{5^{26}}{5^{3}} = 5^{26-3} = 5^{23}$$

Imp **

$$(a^m)^n = a^{m.n}$$

$$(3^2)^3 = 3^{2\times3} = 3^6 \quad \text{Ans}$$

$$3^{2^3} = 3^{2\times2\times2} = 3^8 \quad \text{Ans}$$

$$3^{2^3} = 3^8 = 3^{256}$$

$2\times2\times2 = 8$

$$((3^2)^2)^3 = 3^{2\times2\times3} \Rightarrow 3^{12}$$

$a^{-m} = 1/a^{m}$

$2^{-5} = \frac{1}{2^5}$

$2^{5} \times 2^{-3} \times 2^{7} = 2^{5+(-3)+7} = 2^{5-3+7} = 2^{9}$

$\frac{2^{-4} \times 2^{-7}}{2^{-4} \times 2^{-34}} = \frac{2^{4} \times 2^{34}}{2^{4} \times 2^{7}} = 2^{34-7} = 2^{27}$

$$a^{\frac{1}{n}} = \sqrt[n]{a}$$

$\sqrt{}$ Root $\rightarrow x^{\frac{1}{2}}$

$32^{\frac{1}{5}} \rightarrow n = \sqrt[5]{2\times2\times2\times2\times2} = 2$ Ans

$25^{\frac{1}{2}} \rightarrow n = \sqrt[2]{25} = \sqrt{5\times5} = 5$ Ans

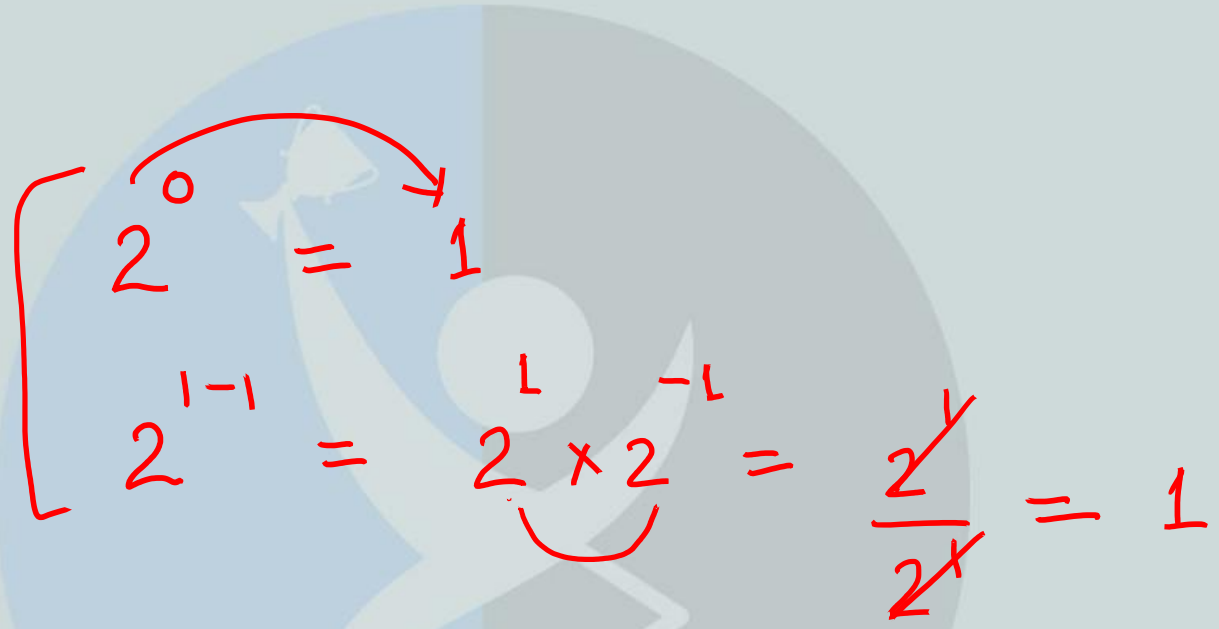
5	125
5	25
5	5
	1

$64^{\frac{1}{2}} \rightarrow n = \sqrt[2]{64} = \sqrt{8\times8} = 8$ Ans

$64^{\frac{1}{3}} \rightarrow n = \sqrt[3]{64} = \sqrt[3]{4\times4\times4} = 4$ Ans

$125^{\frac{1}{3}} \rightarrow n = \sqrt[3]{5\times5\times5} = 5$ Ans

$a^0 = 1$



Which of the following values is same as $2^{2^{2^2}}$ (PYQ)

1.2^6

2.2^8

3.2^{16}

4.2^{32}

$2^{2^4} = 2^{2\times2\times2\times2} = 2^{16}$

$16^{0.16} \times 2^{0.36}$ is equal to:

1. 1.0
2. 2.1
3. 3.3
4. 4.2

$16 = 2^4$

$(2^4)^{0.16}$

$(2^4)^{0.16} \times 2^{0.36}$

$2^{(4 \times 0.16)} \times 2^{0.36}$

$2^{0.64} \times 2^{0.36}$

$0.64 + 0.36$

0.64
0.36
1.00

$2^1 = 2$

Ans

If $3^{(x+8)} = 27^{(2x+1)}$, find the value of x.

1. 2
2. 1
3. 6
4. 4

$3^{(x+8)} = (3^3)^{2x+1}$

$3^{x+8} = 3^{3\times(2x+1)}$

Equal

$(x+8) = (6x+3)$

$x+8 = 6x+3$

$5 = 5x$

$x = 1$

$$625^{0.17} \times 625^{0.08} = 25^{?} \times 25^{-\frac{3}{2}}$$

1. 1.1
2. 2.2
3. 3.3
4. 0.5

$625^{0.17+0.08} = 25^{(x-\frac{3}{2})}$

$(25^2)^{0.25} = 25^{(x-1.5)}$

$(25)^{0.5} = (25)^{x-1.5}$

$0.5 = x - 1.5$

$1.5 + 0.5 = x$

$x = 2$

$x + f(-\frac{3}{2})$

$(x - 1.5)$

$\frac{3}{2}$

$2\overline{)3}\,(1.5$

$\frac{2}{10}$

Suppose $(729)^{\frac{22}{3}}(81)^{\frac{x}{2}} = 3$. The value of x is (PYQ JUNE 2023)

1. -21
2. -21.5
3. -22
4. -20.5

$(9^3)^{\frac{22}{3}} \times (9^2)^{\frac{x}{2}} = 3 = \sqrt{9}$

9	729
9	81
9	9
	1

$9^{\frac{3\times22}{3}} \times 9^{\frac{2\times x}{2}} = 9^{\frac{1}{2}}$

$9^{22} \times 9^{x} = 9^{0.5}$

$9^{22+x} = 9^{0.5}$

$22 + x = 0.5$

$x = 0.5 - 22$

$x = -21.5$

Which of the following is INCORRECT?

(PYQ)

1. $3^{\frac{1}{2}} + 3^{\frac{1}{2}} + 3^{\frac{1}{2}} = 3^{\frac{1}{2}} \times 3^{\frac{1}{2}} \times 3^{\frac{1}{2}}$ → 0.5

$3^{1} \times 3^{\frac{1}{2}} = 3^{1+\frac{1}{2}} = 3^{1.5}$ (0.5 ↑)

2. $4^{\frac{1}{3}} + 4^{\frac{1}{3}} + 4^{\frac{1}{3}} + 4^{\frac{1}{3}} = 4^{\frac{1}{3}} \times 4^{\frac{1}{3}} \times 4^{\frac{1}{3}} \times 4^{\frac{1}{3}}$ ✓

$3^{0.5+0.5+0.5} = 3^{1.5}$

3. $5^{\frac{1}{4}} + 5^{\frac{1}{4}} + 5^{\frac{1}{4}} + 5^{\frac{1}{4}} + 5^{\frac{1}{4}} = 5^{\frac{1}{4}} \times 5^{\frac{1}{4}} \times 5^{\frac{1}{4}} \times 5^{\frac{1}{4}} \times 5^{\frac{1}{4}}$

4. $6^{\frac{1}{6}} + 6^{\frac{1}{6}} + 6^{\frac{1}{6}} + 6^{\frac{1}{6}} + 6^{\frac{1}{6}} + 6^{\frac{1}{6}} = 6^{\frac{1}{6}} \times 6^{\frac{1}{6}} \times 6^{\frac{1}{6}} \times 6^{\frac{1}{6}} \times 6^{\frac{1}{6}} \times 6^{\frac{1}{6}}$

Ans

(2) $4^{1} \times 4^{\frac{1}{3}} = 4^{1+\frac{1}{3}} = 4^{\frac{3+1}{3}} = 4^{\frac{4}{3}}$

$4^{\frac{1}{3}+\frac{1}{3}+\frac{1}{3}+\frac{1}{3}} = 4^{\frac{1+1+1+1}{3}} = 4^{\frac{4}{3}}$

(4) $6^{1} \times 6^{\frac{1}{6}} = 6^{1+\frac{1}{6}} = 6^{\frac{6+1}{6}} = 6^{\frac{7}{6}}$

$6^{\frac{1}{6}+\frac{1}{6}+\frac{1}{6}+\frac{1}{6}+\frac{1}{6}+\frac{1}{6}} = 6^{\frac{1+1+1+1+1+1}{6}} = 6^{\frac{6}{6}} = 6^{1}$

If $4^{(x-y)} = 64$ *and* $4^{(x+y)} = 1024$, then find the value of x.

1. 3
2. 1
3. 6
4. 4

Given that $a \neq b$ and $a, b > 0$, and $\frac{a^{n+2}+b^{n+2}}{a^n+b^n} = ab$ then $n =$ **(PYQ)**

1. 1
2. $\frac{1}{2}$
3. $\frac{-1}{2}$
4. -1

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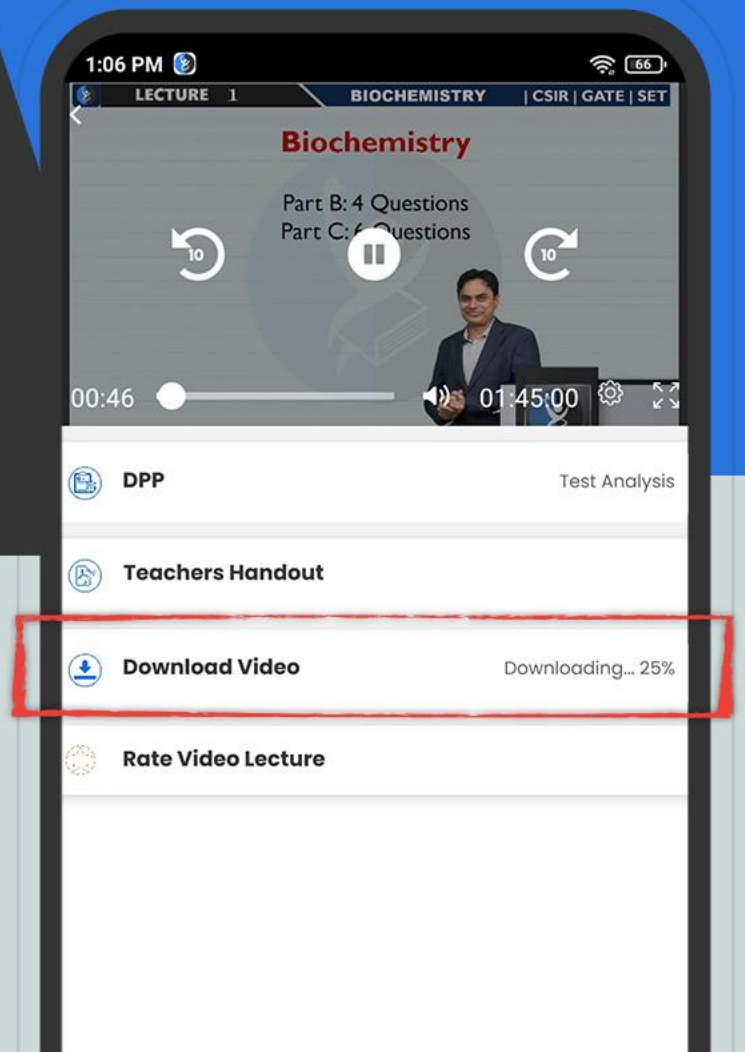

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